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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of: Daniel Coy, *et al.*	)	APPARATUS AND METHOD FOR CLASSIFYING FINE PARTICLES INTO SUB AND SUPRA MICRON RANGES WITH HIGH . . .
Application No. 10/849,283	)	
	)	Group Art Unit: 3653
Application Filing Date: 05/18/04	)	
	)	Examiner: Jonathan R. Miller
	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF DANIEL C. COY UNDER 37 C.F.R. § 1.132

The declarant, Daniel C. Coy, having been duly warned of the consequence of making false statements, as set forth below, hereby declares truthfully as follows:

1) I have been working in the field of nanoparticle separation for 5 years. Prior experience includes work in the field of computational fluid dynamics for 5 years. I am a research scientist employed by Nanophase Technologies, Incorporated, a company specializing in the manufacture and sale of nanocrystalline materials.

2) I am also a named inventor of the above-identified patent application, and as such, have reviewed the originally filed specification and the subject matter of all pending claims, as amended by the Office Action Response submitted herewith (the "Invention").

3) I have been told that the Invention is objected to because the originally filed patent application did not fairly disclose a settling chamber comprising first and second flow patterns that re-circulate in opposite directions (*i.e.*, sympathetic flow patterns).

4) I am aware of various sources that support this definition of the term "sympathetic." For example, U. Ghia, et al. in an article entitled "Analysis & Control of Unsteady Separated Flows," employs such a definition. Interdependency is a property of sympathetic flow patterns, which leads to flow patterns rotating in opposite directions.

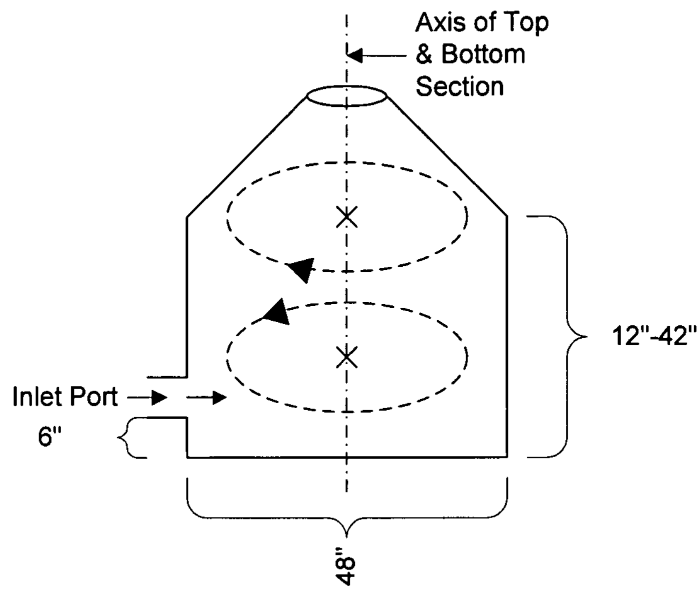
5) Further, it is my opinion that such sympathetic flow patterns are inherent or necessarily present in the teachings of Applicants' originally filed disclosure.

6) In select embodiments of Applicants' invention, as originally disclosed, the configuration and dimensions of the chamber, as well as the positioning of the inlet port and the flow rate for introduction of the gas stream necessarily yield "sympathetic" flow patterns.

7) In one such embodiment, the base of the settling chamber is about 48.0 inches, with the inlet port positioned about 6.0 inches above the base or floor of the vessel. *See* original disclosure at ¶¶ [0023]-[0024]. The diameter of the inlet port may be about 12.0 inches. *Id.* at ¶[0023]. And the height of the chamber side may be between 12.0 inches and 42.0 inches. *Id.* at ¶¶ [0025].

8) Thus, a ratio of height to width of this chamber may be between about 1:1.14 and about 1:4 and a ratio of the position of the inlet port relative to the bottom section to the diameter of the inlet port may be between about 1:2 and zero.

9) A picture of one embodiment of the chamber, with sympathetic flow patterns, looks like this:



10) With the introduction of a gas stream into the above chamber at a volumetric flow rate between 100-200scfm, it is a fundamental principle of fluid dynamics that the gas stream will necessarily separate into sympathetic flow patterns. In one embodiment, the first recirculating flow pattern circulates in a counterclockwise direction while the second "sympathetic" recircultating flow pattern circulates in a clockwise direction. In another embodiment, an axis of rotation of at least one of the flow patterns is horizontal and substantially perpendicular to the inlet port. Sympathetic flow patterns are, therefore, an inherent feature or advantage of the Invention, and were present in the originally filed disclosure.

11) I have also reviewed U.S. Pat. No. 5,174,455 to Zelazny et al. ("Zelazny"), which was used as the basis to reject our Invention. In particular, I have been told that Zelazny Fig. 2 and its accompanying disclosure allegedly teaches our Invention.

12) Although the chamber of the Invention and Zelazny's chamber share the same shape, that is where the similarity ends. The Zelazny Chamber separates particles by reducing

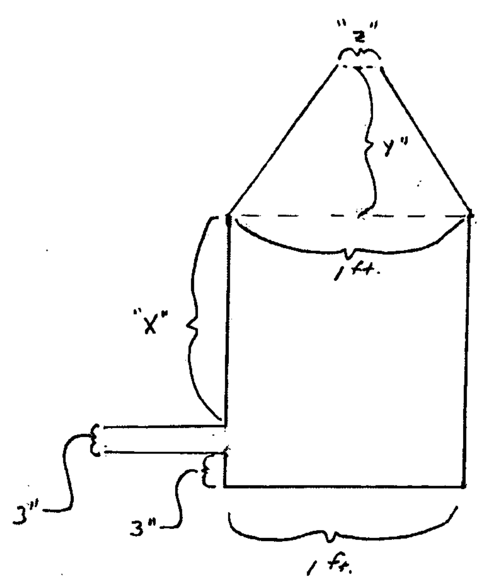
the flow velocity so coarse particles settle out by their own weight. A flow baffle made of 75 micron screen is placed in the flow stream to hinder the passage of coarse particles. Zelazny also discloses inducing a cyclone effect on the particles (particle rotation around the vertical axis as shown in Zelazny Figure 2), the cyclone effect resulting in the collection of coarse particles in the lower portion of the tank. The Zelazny flow patterns, given in Figures 1 and 2, are from top to bottom with the possibility of a cyclone effect around the vertical axis – **sympathetic flow patterns** are never established. Zelazny does not disclose the formation of a flow interface or the formation of a flow pattern related to the present invention, because they do not occur in the Zelazny devices.

13) It is well known that gas streams with commercially significant loadings of electrostatically "sticky" nanoparticles plug even extremely coarse porous membranes almost immediately. After the membrane plugs, it effectively becomes a baffle, or impingment plate. This configuration has been shown to be ineffective in the field of application of the present invention (see Fig. 1, Fig. 2 of the Applicant's application). Zelazny embodiment 2 (Fig. 2) is a simple cyclone separator with the lower discharge removed. This device is different from the present invention by the discussion given above. Further, the primary mode discussed by Zelazny involves operation at 4500 ft/min resulting in a separation cut-off of 500 microns. In the field of application of the present invention, such low levels of separation performance are far below the acceptable performance of standard equipment and are have no commercial importance.

14) Contrary to the originally filed disclosure of the Invention, Zelazny's written description does not state the dimensions of the device shown at Fig. 2. With the exception of the three inch distance from the inlet port to the base, the only dimensions disclosed by Zelazny

relate specifically to the tank of Fig. 1. Zelazny, at col. 2, lines 67-68 states tank **12** preferably has a volume approximately 5 cubic feet and a diameter of no less than 1 foot." When referring to Fig. 2, Zelazny refers specifically to the tank with reference character **52,** not **12**. In sum, the lone dimension Zelazny discloses for the tank of Fig. 2 is that the inlet port is positioned three inches above the base.

15) Even assuming the volume and width of the Zelazny tank of Fig. 1 were applied to Fig. 2, I do not believe it is possible to determine the relevant dimensions of the Zelazny tank. Since Zelazny's tank is a cylinder with a frustoconical top, the absence of the height of the cylinder and the height of the frustoconical top precludes calculation of the dimensions of the tank:



Zelazny Fig. 2

16) Without the height of the cylinder "x" and the height of the cone "y" atop the cylinder, the volume of the tank (5 cubic feet) in connection with its width (no less than 1 foot) do not enable me to determine the dimensions of the tank or the positioning of the inlet port relative to the top and bottom of the tank. Calculation of these dimensions would be guesswork,

as various numbers could be used for these dimensions and still satisfy the volumetric measurement of 5 cubic feet.

17) Thus, it is simply not possible to determine whether positioning the inlet port three inches above the base necessarily yields first and second sympathetic flow patterns. I cannot ascertain whether three inches affords enough room for establishment of a re-circulating flow pattern in the bottom portion of the Zelazny chamber.

18) I do not believe that introduction of gas streams into Zelazny's Fig. 2 tank "necessarily" causes sympathetic flow patterns or that the flow patterns therein necessarily rotate about a horizontal axis that is substantially perpendicular to the inlet port.

July 29, 2005

Daniel C. Coy

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I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" on the date indicated above and is addressed to the Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450. Mary Anne E West